TECHICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN CIVIL ENGINEERING (HDBC 12J)

AMA 3204: ORDINARY DIFFERENTIAL EQUATIONS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*
- *Laplace Table*

This paper consists of **FIVE** questions.
Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) Determine inverse Laplace transform of the following:

$$L^{-1}\left\{\frac{3s^2+2s+3}{(s+1)(s+2)}\right\}$$

(i)

$$L^{-1}\left\{\frac{s+1}{s(s+2)}\right\}$$

(ii)

$$L^{-1}\left\{\frac{3s+2}{(s+1)(s+2)(s+3)}\right\}$$

(iii)

$$L^{-1}\left\{\frac{15}{s^2+4s+13}\right\}$$

(iv) **(12 marks)**

$$\frac{d^2y}{dx^2}+4\frac{dy}{dx}+4y=3$$

b) Solve **(8 marks)**

Question Two

a) (i) Use Laplace transforms to solve:

$$\frac{dx}{dt}-2x=4$$

given that t = 0, x = 1 **(10 marks)**

$$h\left\{\cos\left(\frac{1}{3}t\right)\right\}$$

(ii) Evaluate; **(2 marks)**

b) Give the general solution of the differential equation $y''-y=1$ **(8 marks)**

Question Three

a) Solve the following Bessel's equation:

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+\left(x^2-n2\right)y=0$$

(10 marks)

b) Solve, $\frac{d^2y}{dx^2} - 4y = 24\cos 2x$, given $x = 0,\ y = 3$ and $\frac{dy}{dx} = 4$ **(10 marks)**

Question Four

a) Determine:

(i) $L\left\{\sin\left(\frac{1}{5}t\right)\right\}$

(ii) $L\left\{\sec\left(\frac{4}{5}t\right)\right\}$

(iii) $L\left\{e^{\frac{1}{3}t}\right\}$

(iv) $L\left\{\frac{5}{8}e^{-3t}\right\}$ **(8 marks)**

b) Solve $2\frac{d^2y}{dx^2} - 5\frac{dy}{dx} - 3y = 4\sin 2x$ **(12 marks)**

Question Five

a) Determine:

(i) $L^{-1}\left\{\frac{4s^2 - 17s - 24}{s(s+3)(s-4)}\right\}$

(ii) $L^{-1}\left\{\frac{5s^2 - 4s - 7}{(s-3)(s^2+4)}\right\}$ **(8 marks)**

b) Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = 5$ given that $\frac{d^2y}{dx^2} = \frac{dy}{dx} = 1,\ y(0) =$ l **(12 marks)**